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## RADIATION INDUCED BONE SARCOMA

### — A Case Study —

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#### 骨の放射線性肉腫の1例

#### — 附：多発性血管腫のX線像 —

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左側大腿骨の悪性巨細胞腫と組織診断された症例につき、その1群のX線フィルムから、

(1) 軟組織脂肪層内の多発性血管腫が診断出来ること、そして、

(2) それが肥大型であること(写真3 A, B). と、或は体表面に現われたであらう母斑の色彩などから、悪性腫瘍が疑われて長期にわたり大量の

X線が加えられたのかも知れないが、弱年者であるため、

(3) 骨の發育障害、外骨腫、放射線性骨炎(写真1, 2, 3), 放射線性肉腫(写真1)を誘発した、と結論出来ることなど、を記載し、若干の考察を加えた。

The following case is reported as a radiological curiosity of any form of modern radiation therapy.

#### Report of a Case

A thirteen year old female was admitted to the A Hospital with a history of having retarded the development of left leg received radiation therapy for some multiple skin lesion of the left leg.

Roentgenogram of left knee on admission, January 8, 1962 revealed advanced lytic destruction of the distal metaphysis of left femur with marked radiation osteitis of its surrounding area including the distal epiphysis, and the proximal ends of the left tibia and fibula, as well as patella as shown in Fig. 1.

From December 2, 1952 to August 28, 1954, 70 x-ray treatments were given, 150KV, 3.0 mA, 0.5 mm Cu, 0.5 mm Al filter: focus-skin-distance 30 cm; total 17,000r/air-dose in the B Hospital. Further clinical information on this aspect is lacking.

Amputation was done, and the pathologic report was malignant giant-cell tumor with the rather complex histologic pattern.

Roentgenograms were collected to evaluate this case from two other hospitals. Figure 2, roentgenogram made at the C Hospital, dated of July 6, 1958 revealed evidence of radiation osteitis with streaky, patchy, or blotchy areas of radiopacity and

scattered areas of radiolucency. Figure 3 (A and B), roentgenogram made at the D Hospital, under date of June 26, 1954 showed a soft tissue swelling of the left leg, especially in the subcutaneous fat layer. Note the widened fat density outer the water density of muscles as compared with the right. Figure 3,B is a close up of the left side. Individual vessels appeared as multiple tubular shadows embedded in that subcutaneous fat. There was also evidence of sclerosing radiation osteitis at the area of left knee.

The proximal metaphysis of fibula has had exostosis since around July 1958 as shown in Fig. 2.

### Comment

The present case illustrates a result of the attempt to control by radiation a skin disease. But, the question arises why such aggressive radiation was given on the area of knee with growing bones over a long period. Further clinical information on this aspect of her disease is lacking as above described. It might be suspected of malignancy of skin such as melanoma by a radiotherapist without histologic examination.

The roentgen evaluation of the neoplasms of the soft tissues of the extremities can sometimes be quite specific in reaching a proper diagnosis as to the cell type of the tumor. But, few of these are specific for a particular disease entity with the exception of hemangiomata like the present case as shown in Fig. 3, A and B, and the classic example of fatty tumor. It is of very interest and important to note that a roentgenogram eight years before admission reveals that the individual peripheral vessels appeared as multiple tubular shadows embedded in the more radiolucent fat layer. The various solid tumor of the soft tissues cannot be always differentiated from each other on the basis of density alone, but their location and distribution can be determined more exactly by the roentgen method like the present case than by any other means short of surgery<sup>1)10)</sup>, and the present case may be called as an early stage of Klippel-Weber-syndrome<sup>4)8)</sup>, from the roentgen findings of Fig. 3.

The pathologic report was malignant giant-cell tumor as described above. In 1940, Jaffe, Lichtenstein, and Portis<sup>6)</sup> offered a specific definition of giant-cell tumor which has gained wide, though not necessarily universal, acceptance. They considered it a distinctive neoplasm apparently arising in the nonosteoblastic connective tissue, composed of vascularized network of spindle-shaped or ovoid stromal cells interspersed with multinuclear giant cells. It may be mimic or mistaken for osteogenic sarcoma<sup>6)</sup> or even benign osteoblastoma<sup>9)</sup> and chondroblastoma<sup>11)</sup> and other bone tumors, pathologically and roentgenologically<sup>3)</sup>. The histologic pattern of the present case also must be complex, because of the epiphyseal area of growing bone.

The main conclusion drawn from this case is that extensive radiation with the prolonged mode by x-ray while controlling the soft part lesion may produce a progressive radiation osteitis<sup>2)5)</sup> which renders the bone and cartilage unfit to function<sup>7)12)</sup>, and more seriously induce a sarcoma in the growing bone.



Fig. 1. Roentgenogram of left knee taken on Jan. 8, 1962. The roentgenologic impression was osteogenic sarcoma within the area of sclerosing radiation osteitis. Solitary exostosis of the left fibula is noted, and it is compatible with radiation induced change.

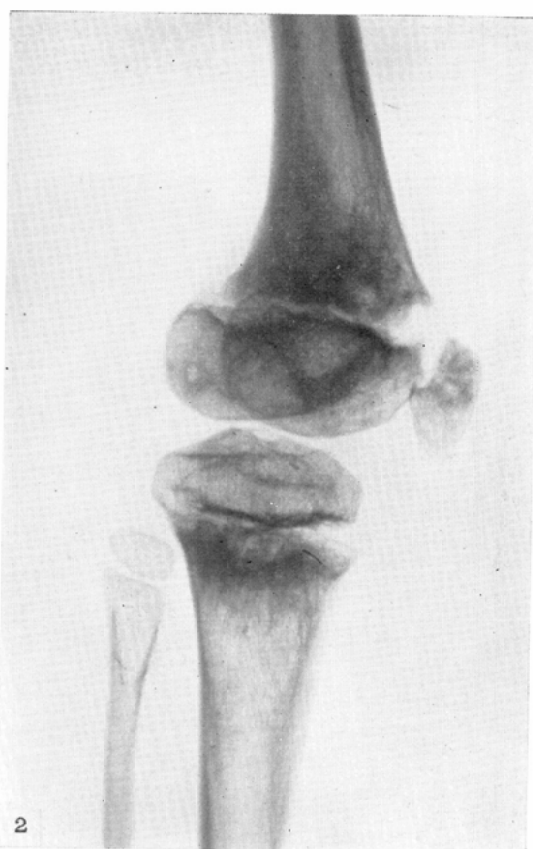


Fig. 2. Roentgenogram made on July 6, 1958 revealed evidence of radiation osteitis with streaky, patchy, or blotchy areas of radiopacity and scattered areas of radiolucency in the distal femur and proximal tibia and fibula, as well as patella.



Fig. 3 (A and B). Roentgenogram made on June 26, 1954 revealed a soft tissue swelling of left lower extremity, especially in the subcutaneous fat layer. Note the more radiolucent wide fat density outer the water density of muscles as compared with the right side. Fig. 3, B is a close up of the shaft. Individual vessels appeared as multiple tubular shadows embedded in that subcutaneous fat. There was also evidence of sclerosing radiation osteitis at the area of left knee, receiving a total of 13,000r (in air) delivered over a period of 19 months, as shown in Fig. 3, A.



### Summary

Two features of special interest appear in the roentgen findings of this case:

1. Bone sarcoma following external radiation associated with extensive radiation osteitis as shown in Fig. 1 and 2.

2. The main lesion of the soft part appears to have been highly suspected of extensive hemangiomata of left lower extremity with an early stage of Klippel-Weber-syndrome as shown in Fig. 3.

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